

1   **WHAT IS CLAIMED IS:**

- 2   1.    A module for use in a compact fuel processor, comprising:  
3       a module inlet for receiving a feed stream;  
4       a module outlet for producing an effluent stream;  
5       a reactor having a reactor inlet, a reactor outlet, and catalyst bed forming a fluid  
6       communication conduit between the reactor inlet and the reactor outlet;  
7       wherein the module inlet is in fluid communication with the reactor inlet and the  
8       module outlet is in fluid communication with the reactor outlet; and  
9       wherein the combination of module inlet and module outlet form a heat exchanger  
10      for heating the feed stream against hot reactor product prior to being introduced to  
11      the reactor inlet.
- 12   2.    A module for use in a compact fuel processor, comprising:  
13      a module inlet for receiving a feed stream;  
14      a module outlet for producing an effluent stream;  
15      a reactor having a reactor inlet, a reactor outlet, and catalyst;  
16      an inlet spiral passage in fluid communication with the module inlet to the reactor  
17          inlet; and  
18      an outlet spiral passage in fluid communication with the reactor outlet to the  
19          module outlet;  
20      wherein the feed stream is introduced to the module inlet, passes through the inlet  
21          spiral passage, and is heated by hot reactor product passing through the outlet  
22          spiral passage.
- 23   3.    The module described in claim 2, wherein the reactor is a fixed bed reactor.
- 24   4.    The module described in claim 2, further comprising a flow distribution manifold  
25      in fluid communication with the reactor inlet for evenly distributing flow into the  
26      reactor.

- 1     5.     The module described in claim 4, further comprising a flow collection manifold in  
2     fluid communication with the reactor for directing the hot reactor product to the  
3     reactor outlet.
- 4     6.     An autothermal reforming module for use in a compact fuel processor,  
5     comprising:  
6     a module inlet for receiving a feed stream;  
7     a module outlet for producing an effluent stream;  
8     a fixed bed reactor having a reactor inlet, a reactor outlet, and autothermal  
9     reforming catalyst;  
10    an inlet spiral passage in fluid communication with the module inlet to the reactor  
11    inlet;  
12    an outlet spiral passage in fluid communication with the reactor outlet to the  
13    module outlet;  
14    a flow distribution manifold in fluid communication with the reactor inlet for  
15    evenly distributing flow into the reactor; and  
16    a flow collection manifold in fluid communication with the reactor for directing  
17    hot reactor product to the reactor outlet;  
18    wherein the feed stream is introduced to the module inlet, passes through the inlet  
19    spiral passage, and is heated by the hot reactor product passing through the outlet  
20    spiral passage.
- 21    7.     The autothermal reforming module described in claim 6, wherein the autothermal  
22    reforming catalyst includes supported catalyst particles.
- 23    8.     The autothermal reforming module described in claim 6, wherein the autothermal  
24    reforming catalyst includes monoliths.
- 25    9.     The autothermal reforming module described in claim 6, wherein the autothermal  
26    reforming catalyst includes a partial oxidation catalyst.

1     10.     The autothermal reforming module described in claim 9, wherein the autothermal  
2     reforming catalyst includes a steam reforming catalyst.

3 11. The autothermal reforming module described in claim 6, wherein the feed stream  
4 is a mixture of air, steam, and hydrocarbon fuel.

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[illegible]